SOME ANTHROPOLOGICAL CHARACTERISTICS OF HYBRID POPULATIONS*

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N approaching the general problem of race crossing, it is important at the outset to make some distinctions between anthropological and the genetical points iew as they are applied to studies of n beings. The anthropologist is pri- y concerned with what happens to large ps of people rather than to individuals. egards the situation in its descriptive cts, and, to start with at least, he may no theories as to the mechanism of inheritance of physical characters. The tion of the geneticist is usually somewhat ent. His chief interest being in the mode *ndividual* inheritance, the material he iders first will be composed of separate ly lines, so that the groups with which eals are often small in comparison with " populations " of the anthropologist.

n spite of the distinction just made be- n the anthropological and the genetical oaches, it should be realized that they o some degree complementary, and that is impossible to reconcile their findings, must be due to erroneous deductions the material of one or the other. The opologist has in mind the situation as it lly exists, and his data are seldom of a le nature or such that the information he ires about them is relatively complete. n there has been extensive inter- ding between two populations repre- senting distinct human types, the conditions under which it has taken place are always very different from any ideally controlled ones such as those arranged by the geneticist in his experimental work on non-human material. For example, the original numbers of the racially distinct individuals that contributed to the ancestry of a particular hybrid population may have been markedly dissimilar, and usually they are quite unknown. It is only in exceptional cases that their proportions can be safely inferred, as in that of the *Bounty* mutineers and the Polynesian women with whom they mated. In general, all that can be stated with certainty about a hybrid population is that it has been derived from at least two racial stocks, though their respective contributions to it may be a matter of vague conjecture. At any particular time, too, it may include individuals representing almost every grade of intermixture between the parental stocks, and there are seldom reasons for supposing that it has remained isolated without backcrossing to one or both of these or even being affected by exposure to fresh infiltration. Such hybrid communities are obviously very involved in their biological constituents, but they are the ones that do in fact occur, and it is necessary to study them in order to reach conclusions of practical value.

A great deal of confusion has been caused by failure to appreciate the distinction between the group and the individual situations. One of the main objects of the anthropologist is to trace the descent of human groups, and the problem of miscegenation is of great importance to him, as a knowledge of its consequences must be obtained before he can hope to reconstruct his racial genealogies. As a rule, most anthropologists have taken more or less for granted certain

hould be explained that " hybrid " is used here restricted zoological sense, viz. as relating to ecific rather than to interspecific crosses. The ive " mixed," though convenient, can be mis- g, since there is no acceptable definition of what utes a " pure " human race. For the purposes present discussion, " hybrid " will be taken to to crosses between races comprised within t major divisions of mankind such as the ies " of Blumenbach and the main " groups " ddon, Hooton and other anthropological atists.

generalizations bearing on the effects of race crossing. To cite an instance, it is often supposed that when two populations have crossed to form a third, the average values of the physical characters of this last will be intermediate in relation to those of its progenitors. The fact that in such a case the anthropologist is thinking of an amalgamation of *group* characteristics is generally overlooked and has given rise to much unprofitable discussion of "blending inheritance." * Again, the opinion is frequently held that the crossing of markedly distinct racial stocks will result in a population that displays a peculiarly large variability and that the frequency distribution curves of its metrical characters will in turn be of an unusual kind, possessing more than a single mode or peak.

Such questions are of prime anthropological importance, and it is strange that no comprehensive examination of the most suitable material for testing their validity, namely that furnished by the intermixture of groups representing widely different human types, has yet been made. They have, it is true, been considered empirically in the case of particular studies of hybrid communities, but with results which have not always been in accord. Extreme types can be chosen deliberately, because it seems safe to infer that they will provide the best evidence required to answer the general problem. It is not suggested, of course, that the nature of the mechanism of inheritance will differ, though the types of genes may, in crosses between European and Negro groups, for example, from that which obtains when European groups are crossed *inter se.*

Several hybrid communities have been investigated anthropologically within the past forty years, but the information presented by many of the observers is quite inadequate for the demands of a modern survey. In the present instance, it has been possible to select nine studies—three of crosses between Europeans and Negro and related races, three of crosses between Europeans and American Indians and three of crosses between Europeans and other non-European peoples—which afford a more or less satisfactory basis for some preliminary conclusions.

For the kind of treatment that is now attempted, data relating not only to the hybrid population but also to both parental populations are required, and these data consist of measurements of living subjects. It must be acknowledged that, for practical purposes, there are no measurements whatever available for the actual parental groups from which the hybrids were derived. In all such cases the process of intermixture has been of varying duration and has taken place within a period extending, as far as is known, from the beginning of the sixteenth until almost the end of the nineteenth century.* Of the nine hybrid series considered, the earliest to be examined was not measured until 1898. All the original parents of either purely European or purely non-European origin had probably died before this date, and there are no anthropometric records for them. What can be obtained, and what have actually been used, are measurements of groups believed to be descended from those populations which actually contributed the parents. It is important to appreciate the point just made, because analysis of the situation becomes much more difficult if the parental populations were themselves changing phenotypically within the period mentioned. In fact, so far as physical characters are concerned, there is no good evidence to show whether they were changing or not, except some relating to the past few decades, and the best comparisons possible are obviously far from ideal. There is a danger, for example,

* An adequate knowledge of the group characteristics of hybrid populations may not throw any clear light on the mode of individual inheritance, though the position will be different in the case of the blood groups, say, for which this is relatively simple, and in that of metrical characters, which appear to be determined by a number of genes.

* A striking exception is provided by Hawaii, where primary miscegenation still occurs on a fairly wide scale. A study of race crossing in the Hawaiian archipelago is now being undertaken by Dr. Harry L. Shapiro of the American Museum of Natural History, and the results of such a careful and unprejudiced workers will doubtless clarify the problems arising in this important area, for which the available material is deplorably sparse.

that the purely European or purely non-European groups from which the hybrids derive may not have been truly random samples of the populations to which they themselves belonged, and a great deal of uncertainty must consequently arise regarding the material used in particular comparisons.

Imperfections of the Evidence

The nine hybrid series to which reference has been made will be described later in this paper, but certain of their features may be commented upon now. It is extremely probable that in the initial crosses most of the fathers were Europeans and the mothers non-Europeans, but a small proportion of European women may have intermarried with members of the hybrid population in later generations. On the whole, it will be convenient to assume that the immediate ancestors of the first generation were exclusively European males and non-European females. It is unfortunate that there are no data relating to the sort of first filial generation considered by geneticists in the case of any of the series dealt with here, and it can only be supposed that each of them has been made up of individuals whose " impure " pedigrees are quite likely to represent, contemporaneously, varying grades of intermixture. In general, there is no information regarding the degree of genealogical heterogeneity shown by a particular series, but two instances exist in which either the conditions of the formation of the cross were different from those of the rest or in which some details of the kind indicated are available.

As has already been pointed out, the descendants of the *Bounty* mutineers are in certain respects unique. It is known that they are mainly derived from a few primary crosses between Englishmen and Tahitian women. Their pedigrees are thus approximately of the same length and each subject may be regarded as the product of equal amounts of European and non-European ancestry, provided that such factors as selective mating or differential death-rates can be overlooked. By reason of their geographical isolation, the inhabitants of Pitcairn and Norfolk have formed practically a closed community, and the prolonged inbreeding which has occurred on these two islands takes on the aspect of an unpremeditated biological experiment. There is little doubt that several back-crosses to the parental populations are represented in the eight other hybrid groups, none of which has been isolated to the same extent as the Pitcairn and Norfolk Islanders. Some investigation of pedigrees was undertaken in five studies and attempts were made to construct sub-series containing different proportions of intermixture between the parental groups. Owing to the small size of most of these sub-series, it is not profitable to consider them separately for the purpose of analysis, except in a single case, that of American Negroes of Mixed Blood. All the remaining series, then, comprise agglomerations of individuals with unequal " impure " pedigrees and possessing various proportions of the two main ancestral stocks.

As far as can be ascertained, and with an exception which will be mentioned later, each hybrid population treated appears to have been derived from purely European sources, on one side, and a single non-European stock, on the other. In his extensive work on the American Negro, Herskovits (1930) has described a number of hybrid series into the composition of which European, Negro and American Indian elements have entered. These are not large, however, and on this account and because an adequate treatment of them would be an extremely complicated undertaking, they have been omitted from the present discussion.

While little difficulty exists in selecting the hybrid series for consideration, the task of obtaining samples which can fairly be supposed to represent the parental groups is far from easy. All that it seems possible to accomplish in such a direction is to find modern series which may be presumed suitable for the purpose in view if the characters used are not subject to secular change. As an illustration, the type of the half-dozen Englishmen who founded families on Pitcairn Island at the close of the eighteenth century is, for eleven

of the fourteen characters compared, taken to be the same as that of a series of Oxfordshire villagers measured in 1922 and 1923. In this case it is possible that the two groups supposed to be equivalent constituted samples, not absolutely random in nature, of populations which were somewhat different in type. The ten or twelve Tahitian women with whom the *Bounty* mutineers contracted unions are in turn represented by a series drawn from the contemporary population of the whole of the Society Islands. The best comparisons which can be made under such circumstances are evidently very imperfect. In dealing with the other hybrid series, the conditions are no better. The method employed has been to select samples which appear to give more or less satisfactory representations of the parental groups involved in the formation of the hybrid population and to make comparisons within these triads. At first sight, it seemed quite probable that the material would be too defective to yield suggestions of any value. Actually, the conclusions arrived at are so consistent that it can be concluded that its manifest defects are of less consequence than was feared.

Any adequate statistical characterization of a population demands a sample of sufficient size to furnish reliable constants. It is known from anthropological experience that small samples, composed of fewer than thirty individuals, normally provide either misleading or inconclusive results. There is also some danger that small samples are less likely to have been selected at random from the assemblies they are supposed to characterize than large ones. Again, the numbers of observations recorded for different characters in one sample are seldom constant. In the hybrid series now considered, they range from 880 to 23 in the case of adult males and from 72 to 39 in that of adult females, the majority for adults of both sexes being over 50. Most of these numbers are by no means large for statistical purposes, but the series are the longest available. The samples chosen to represent the parental groups vary in the numbers of observations for different characters from 5,426 to 24 and from 1,549 to 25 in the case of males and females, respectively. On the whole they are larger than those for the mixed series. It is obvious that the ideal statistical requirements are satisfied very imperfectly by the data used.

Owing to the influence of the factor of personal equation in metrical descriptions of living subjects, it would have been a decided advantage if each triad—the hybrid and the two parental series—had been measured by the same observer. This has been done in only two studies. In three others the hybrid and one parental series have been measured either by a single observer or by a small group of observers working in conjunction, and in the rest each one of the three associated series has been described by a different observer. It is well known that comparisons between measurements recorded by several observers working independently will often differ on the average to such an extent that true racial distinctions are entirely obscured, merely on account of the way in which the measurements were taken. This is a regrettable state of affairs, but one which cannot be avoided until anthropometric techniques become more rigorously standardized than they are at present. It may be supposed that exact comparisons can be made between data collected for various series by the same observer or by a number of observers working together. In other cases the position is different for different characters. There may be little danger in comparing statures and cephalic indices recorded by independent observers, but nearly all the measurements of the face and limbs are less reliable. So far as the present material is concerned, an attempt has been made to compare as many characters as could be secured with any reasonable expectation of accuracy, although such a procedure involves retaining some comparisons which are quite likely to be fallacious owing to " errors " of measurement. As the general aim has been to restrict the treatment to adult series, this has necessitated revision of some of the original records in which several immature individuals are included. As a rule, subjects under the age of twenty have been rejected, though their retention in some series cannot altogether be avoided.

Material and Method of Analysis

The nine hybrid series concerned in this paper may be briefly described as follows :

(1) *Norfolk Islanders*, 113 adult male and female subjects, the descendants of six mutineers of H.M.S. *Bounty* and from ten to twelve Polynesian women from Tahiti and possibly two of its neighbouring islands, measured and described by Shapiro (1929). They are compared with 153 male and female Society Islanders, whose measurements were taken by Handy and reduced by Shapiro, and with 6,975 " English " and 381 Oxfordshire villagers, whose measurements were taken by Galton and by Buxton and Blackwood, respectively, and reduced by the writer. The genealogical records of the Norfolk Islanders have been carefully kept since about 1790, and any influx of fresh blood has invariably been noted.

(2) *Half-Blood Sioux*, 77 adult male subjects, including some described as a quarter and others as three-quarters Indian, whose measurements were taken by Boas and eight assistants and reduced by Sullivan (1920). Their European ancestry is said to be French, Scotch, English and Irish. They are compared with 540 full-blood Sioux, measured by the same observers, and with 727 " Old American " Whites, measured and described by Hrdlička (1925). Herskovits (1930) has provided several constants of variation for the last series, and the writer a few others.

(3) *Ojibwa-Whites*, 80 adult male subjects, principally from Minnesota, representing various degrees of intermixture between Ojibwa women and French and Scotch traders which has been " continuous and accumulative " since 1660. They are described by Jenks (1916) and have been compared with 24 full-blood Ojibwa (all that could be obtained) and with 100 Minnesota French and 50 Minnesota Scotch, also measured by Jenks. The constants of variation of these four series have been computed by the writer.

(4) *Yucatecans*, 880 adult male subjects, the product of intermixture between Spanish immigrants into Mexico and Maya Indians over a period of some 350 years, measured and described by Williams (1931). They are compared with 77 presumably unmixed Mayas, measured and described by Steggerda (1932*b*), and with 416 Andalusians measured and described by Hulse (1933), for stature, and 79 subjects from all parts of Spain, whose measurements were taken by Barras and reduced by Williams, for cephalic and facial characters.

(5) *Jamaican " Browns,"* 165 male and female subjects of mixed White and Negro ancestry from Jamaica, measured by Steggerda and described by Davenport and himself (1929). They are compared with one series of 100 Whites of British and German descent and with another of 105 full-blood Negroes, also measured by Steggerda, both coming from the island of Jamaica and its dependencies. The Whites cannot be said to represent ideal comparative material, and as a large proportion of immature subjects is included in all three series, means based on their absolute measurements would appear to be unreliable. Consequently only indices, which are less likely to be affected by possible growth changes, have been used in the present comparison. It is unfortunate that the means and constants of variation provided by Davenport and Steggerda were determined by very crude statistical methods and that mistakes also occur in their computation.

(6) *American Negroes of Mixed Blood*, 254 adult male subjects of European and Negro ancestry, principally from various parts of the United States, measured and described by Herskovits (1930). Genealogies were obtained from each subject, who was then classified with regard to the proportions of White and Negro ancestry he possessed, three main divisions being recognized : (i) more Negro than White, (ii) approximately equal amounts of Negro and White, and (iii) more White than Negro. The number of individuals in each of these divisions makes them, in general, adequate for separate statistical treatment. They are compared with an unmixed American Negro series of 109 individuals, also measured by Herskovits, and with Hrdlička's " Old Americans."

(7) *Boer-Hottentot Crosses* (the so-called " Bastaards " of Rehoboth), 74 adult male

subjects of six or seven generations of mixed Boer and Hottentot descent from South-West Africa, measured and described by Fischer (1913). Fischer, like Herskovits, divides his material into genealogical classes representing different proportions of Boer and Hottentot ancestry. None of these, however, is really large enough for statistical purposes, and the measurements have been pooled to form a general Bastaard series, which is compared with 74 Hottentots, measured by Schultze Jena (1928), and, in default of local Boers, with 70 Dutch, whose forbears come from the northern provinces of the Netherlands, measured and described by Steggerda (1932*a*). The general Bastaard constants of variation and those of the Hottentots have been computed by the writer.

(8) *Kisar Mestizos*, 132 adult male and female subjects of mixed Dutch and Indonesian ancestry from Kisar, a small island in the Sunda archipelago, some thirty-five miles east of Timor. They were measured and described by Rodenwaldt (1927), who ascribes their origin to the seventeenth century. The mestizos are divided by him into genealogical classes, but these are too small for satisfactory statistical analysis, and the material has again to be treated as a whole. For comparative purposes, 64 Kisarese, also measured by Rodenwaldt, and Steggerda's Dutch are used.

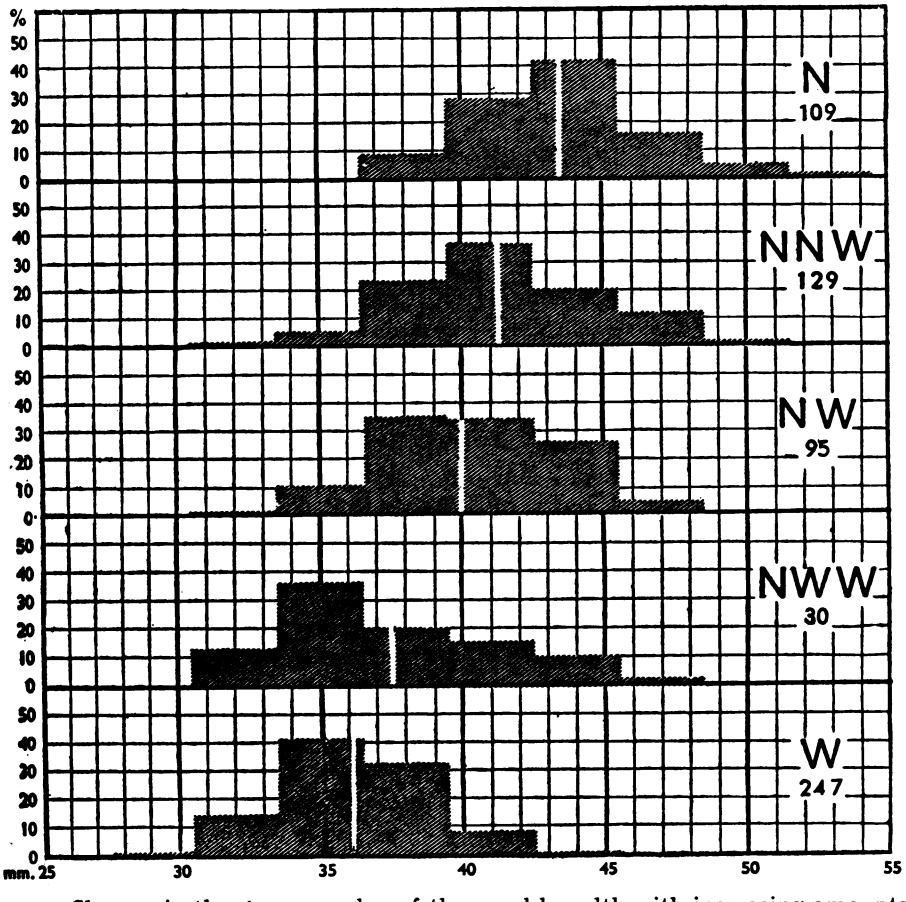
(9) *Anglo-Indians*, " new style," 145 adult male subjects of mixed European and Indian ancestry from Calcutta, whose measurements were taken by Annandale, first reduced by Mahalanobis (1922-31) and later, with the exclusion of some immature individuals, by the writer. There is almost a complete absence of reliable information concerning their origin and it has been found impossible to select suitable material from Indian series for a comparison of means, though in view of their very complex racial antecedents they can be retained for the study of variability.

In any investigation of race crossing it is of interest to examine the physical relation of hybrid populations to the parental stocks. This has been attempted in the most direct way possible, namely by selecting the means of as many characters as are available for both the hybrid sample and those representing the groups from which it is presumed to have been derived, and comparing them pair by pair in terms of the standard errors of their differences. The method adopted is illustrated in Table 1. Comparisons of the kind indicated are admittedly very crude and may be misleading. If for a particular character there is, in fact, no distinction

Character	Means and Standard Errors			Differences in Terms of Standard Errors		
	Society (S)	Norfolk (N)	English (E)	S & N	N & E	S & E
Head Length (*L*)	188·0 ± ·71	195·6 ± ·73	195·5 ± ·66	7·5	—	7·7
Head Breadth (*B*)	159·6 ± ·54	155·5 ± ·54	151·4 ± ·55	5·4	5·3	10·6
Minimum Frontal Diameter (*B'*) ...	102·9 ± ·54	104·0 ± ·55	109·3 ± ·58	—	6·6	8·1
Bizygomatic Breadth (*J*)	145·7 ± ·56	140·9 ± ·66	137·7 ± ·55	5·5	3·7	10·2
Bigonial Breadth (*W*)	107·8 ± ·66	107·6 ± ·58	108·3 ± ·63	—	—	—
Nasal Breadth (*NB*)	43·4 ± ·30	37·6 ± ·35	33·7 ± ·30	12·6	8·5	22·9
100 *B*/*L*	88·0 ± ·42	79·5 ± ·36	77·5 ± ·36	15·4	3·9	19·0
100 *B'*/*B*	64·6 ± ·33	66·9 ± ·36	72·2 ± ·37	4·7	10·3	15·3
100 *J*/*B*	91·4 ± ·29	90·7 ± ·35	90·7 ± ·35	—	—	—
100 *B'*/*J*	70·7 ± ·36	73·9 ± ·40	79·6 ± ·44	5·9	9·6	15·7
100 *W*/*J*	74·0 ± ·45	76·4 ± ·47	78·9 ± ·46	3·7	3·8	7·6

TABLE 1.—Comparison of ♂ mean cephalic and facial measurements of 85 Society Islanders, 64 Norfolk Islanders and 71 English. Any difference less than twice its standard error may be considered insignificant and is omitted from the table. (Compiled from Shapiro, 1929, and Buxton, Trevor and Blackwood, 1938.)

between the true means of the parental series, then the question whether the mean of a sample drawn from the first population is greater or less than the mean of a sample drawn from the second population will be determined merely by chance. In such a case, the further question whether the mean of the sample drawn from the hybrid population falls between the two parental means will also be expected to be determined by chance, and hence no significance can be attached to the order in which the series are arranged by their several means. Where, however, the means of the parental series are widely different, the position of the corresponding mean of the hybrid series in relation to them is of real significance, and, as might be expected on a polymeric hypothesis, its value will tend to approach that of the parental group which has made the greater contribution to it. A rather striking example of this is provided by the changes in position of the mean value of the nasal breadth in Herskovits's male American Negroes, illustrated in Figure 1, where there is a progressive decrease in the direction of the narrower



URE 1.—Changes in the ♂ mean value of the nasal breadth with increasing amounts of European try in three series of American Negroes of Mixed Blood. The vertical white line in the body of each bution represents the position of the mean. The interpretation of the symbols in the extreme right is as follows: N unmixed Negro, NNW more Negro ancestry than White, NW approximately amounts of Negro and White ancestry, NWW more White ancestry than Negro, W "Old American" . The figures below a symbol denote the number of individuals in the series. The negative skewness NWW distribution is almost certainly due to the small size of the sample. (Compiled from Hers- 1930, and Hrdlička, 1925.)

European nose with increasing amounts of White ancestry.

The results obtained from a total of 102 comparisons of male and female series are shown in Table 2, in which the position of the mean of the hybrid sample is considered with reference to the differences between the presumed parental groups and its own differences from them. It will be seen from Table 2 that as the significant differences between the mean values of the several series in a triad become more numerous, the relative frequency with which the hybrid means are intermediate increases correspondingly, a fact which would seem to validate a principle of the classification of racial groups which has generally been assumed in anthropological taxonomy.

Variability and Forms of Distributions

The problem of human variability has recently attracted the attention of a number of workers in both anthropology and genetics, and it still bristles with difficulties. Since the present discussion concerns populations which have resulted from the crossing of distinct racial stocks, it may be asked whether they are more or less variable than other populations not so formed, or comparison may be made between the observed situation with regard to this matter and that which would be expected in the light of theoretical considerations. For the moment, only the first of these two methods of procedure, that is to say the description of a situation which actually exists, will be touched upon. It must be remembered that the topic is treated with reference to the measurements of living people, characters of a particular kind which are unlikely to yield any results which might be susceptible of a simple interpretation even under the most favourable conditions. Problems of inheritance are involved, it is true, but specifically those of *mass* inheritance in the case of subjects whose origins are multifarious and unknown, except within the widest categories, and in the case of physical features of an extraordinarily complex nature. Most anthropological problems are of the same kind.

The series described, though the best available, are far from ideal when considered as samples representative of a few of the hybrid communities which now exist. In this connexion it would be as well to recall some remarks made a little earlier. It is important to realize, in the first place, that the samples in question are assemblages of individuals representing all grades of intermixture between two or more parental groups. Probably the only exception is furnished by the Norfolk Islanders, who may be supposed to be, roughly at least, the descendants of a few members of two distinct racial stocks who intermarried in the first

Class of Comparison	H between P and P′	H not between P and P′	Totals
No significant differences between P and P′	6 or 30·0 per cent.	14 or 70·0 per cent.	20
Significant differences between P and P′, but none between either P and H, P′ and H or both (P and H) and (P′ and H)	34·5 or 76·7 per cent.	10·5 or 23·3 per cent.	45
All differences between P, P′ and H significant	36 or 97·3 per cent.	1 or 2·7 per cent.	37
All comparisons	76·5 or 75·0 per cent.	25·5 or 25·0 per cent.	102

TABLE 2.—Comparison of the positions of ♂ and ♀ means of anthropometric characters between hybrid (H) and the European (P) and non-European (P′) parental populations from which the hybrids are supposed to have been derived. In the few cases in which the means of H and P or H and P′ are identical for a particular character, ·5 has been assigned to each of the second and third columns of the table.

eneration and subsequently inbred, so that ach individual to-day can, with reservations hat have already been mentioned, claim to ossess an equally divided racial heritage.

In these circumstances it would not be rprising if different crossed populations owed variabilities of different orders, so hat generalizations regarding all of them ould not be of much value. As has already een stressed, in the majority of cases the formation regarding the parental groups om which the hybrids have been derived is adequate. There are almost no physical cords relating to them directly, and for is reason it has been necessary to suppose hat data for series which are presumed be their descendants can be used for e comparative purpose in view. The sumption that the parental populations ve not altered appreciably in type or riability during the past three hundred ars is not an unreasonable one, but slight anges of which no knowledge exists may vertheless have taken place.

Another source of uncertainty may be more consequence. In making compari-ns of the mean values of measurements, it s been assumed as a *pis aller* that only one uropean stock was concerned in the for-ation of the hybrid population, which is rtainly no more than a first approximation the truth. If, however, the same series e used in several comparisons of variability ere will be some danger of underestimating e variabilities of the European groups ich actually participated in the cross. It quite impossible to assess the extent to which calculations are falsified on account of this imperfection. A further difficulty is introduced in cases in which the modern hybrid population has been derived from very small numbers of European men on the one side and of non-European women on the other (as in that of the Norfolk Islanders), for these small groups may not have displayed the same order of variability as the large populations to which they belonged. Small samples are often peculiar and they are not likely to represent random selections from total assemblies. Finally, it must be pointed out that the metrical data themselves involve certain defects. Different numbers of characters are available for different comparisons of a hybrid with the two corresponding parental series, and this must not be forgotten when comparisons are made between conclusions drawn from one such triad with those drawn from another. In a few instances it is necessary to admit that the same feature may have been measured by two different observers in ways which are sufficiently dissimilar to affect the comparisons of variabilities. It would be pleasant, of course, to neglect any such imperfections of the evidence when attempting to make general deductions regarding the variability of hybrid populations, but unfortunately they are too obvious to be overlooked.

The method employed here in considering the question of variability was devised by Morant (1933). It takes into account the ratios of the variances (σ^2's) of a number of characters and provides a conventional estimate of the mean variability of one series

Order of Variability	Hybrid Population
more variable than either P or P′	Jamaican "Browns" ♂ and ♀ (17), American Negroes of Mixed Blood ♂ (12), Anglo-Indians ♂ (7).
more variable than P but as variable as P′	Half-Blood Sioux ♂ (9).
less variable than P, but more variable than P′	Yucatecans ♂ (10), Mestizos of Kisar ♂ (4).
less variable than either P or P′.	Norfolk Islanders ♂ and ♀ (14), Bastaards of Rehoboth ♂ (4).

ABLE 3.—Comparison of ♂ and ♀ mean variances (σ^2's) of anthropometric characters between hybrid) and the European (P) and non-European (P′) parental populations from which the hybrids are posed to have been derived. The figure in brackets after the name of a series in the right-hand column notes the number of characters compared.

as compared with another. The results obtained from the material that has been used in the present paper are given in Table 4, in connexion with which two points need clarifying. Herskovits's American Negroes of Mixed Blood are his NNW, NW and NWW series combined, and the standard deviations (σ's) of the non-European series with which the Anglo-Indians are compared were calculated by Mahalanobis (1927) from the measurements of a number of North Indian series included in Risley's classical work *The Tribes and Castes of Bengal*. The impossibility of selecting a single series which might be supposed to represent the indigenous ancestors of the Anglo-Indians has already been commented upon. A more detailed analysis of the data shows convincingly that the variabilities of the hybrids are of the same order as those of the populations from which they have presumably descended. From this conclusion, which certainly fails to coincide with the genetical assumptions customarily made in considerations of race crossing, it is quite clear that most hybrid populations do not tend to be either appreciably more or appreciably less variable than the majority of existing " unmixed " populations.

The question of the unincreased variability of hybrid populations has formed subject of three important papers by Herskovits (1927), Wagner (1932) and Muller (1936). Fischer (1913), was inclined to attribute the low variability of the Bastaards of Rehoboth whom he studied to the unsuitability of the measure of dispersion used, the standard deviation, but Professor Muller, an eminent geneticist, has pointed out that the term " variation " has hardly any exact scientific meaning unless it is defined as the standard deviation, the variance or the coefficient of variation. Some ingenious Mendelian interpretations of unincreased hybrid variability have been advanced by Muller himself, and the one he favours may be quoted :

> " There are several circumstances which could give rise to a comparatively low variability on the part of a population of mixed race, as compared with the original populations which went to form the mixture, without the slightest violation of Mendelian or other accepted genetic principles being involved. One of the possible mechanisms by which such an effect could be produced would involve the partial suppression, in the mixed race, of the intraracial variability of either original race. This suppression might conceivably be so great as to fully compensate, or more than compensate, for that part of the variability of the mixed race which was caused by the segregation from one another of those genes that had caused the two original races to differ. Thus the intraracial variability of the new mixed race would be largely constituted of the *inter*racial differences, and the original *intra*racial differences would now be in part suppressed in their expression."

It should be pointed out that for most of the commonly used anthropometric characters interracial variability, i.e. the variation of the averages for different groups, is very small compared with intraracial variability, i.e. the variation exhibited by individuals belonging to the same group, a fact which Muller does not sufficiently stress.

The view that the distributions of metrical characters in hybrid populations are often bimodal or multimodal in form will be discussed very shortly. Most of the available material is hardly adequate for testing this supposition, but where normal curves have been fitted to distributions of stature, head length, head breadth, bizygomatic breadth, cephalic index and nasal index for hybrid series composed of 75 or more individuals, none of the results suggests any appreciable departure from normality, and the probabilities of the true population distributions being normal in these cases are all quite high.* The question here, of course, is not whether a particular sample gives a distribution which appears to be bimodal or not, but whether any samples can be supposed to indicate that the total assembly from which they were taken exhibits such a peculiarity. The series examined do not indicate that there is a clear departure from the usual symmetrical form of distribution with a single peak in the case of any character and for any population considered.

* The evidential basis of this and other statements in the present discussion will appear in an extended monograph on race crossing in course of preparation by the writer.

Summary and Conclusions

To summarize, the anthropologist, as such, is not concerned specifically with the mechanism of heredity but with certain of its results as they apply to groups of individuals. The observational data he has collected demonstrate in a conclusive fashion that some simple relationships exist between the group characteristics of hybrids and those of the stocks from which they have presumably been derived. The first of these is that the mean values of quantitative characters are intermediate in the hybrid population where there is a clear distinction between the parental groups, the second is that the variabilities of the hybrid population do not, on the whole, tend to be peculiarly high or peculiarly low, and the third is that the distributions of qualitative characters in the hybrid population are approximately normal in form and, so far as can be judged by the data at present available, apparently always unimodal.

In spite of the imperfections of the evidence, these general conclusions may be considered as firmly established. They are of such a nature that it would be possible to reconcile them with any neo-Mendelian theories concerned with the mechanism of individual inheritance. At the present time there is no adequate descriptive material available which could be used to demonstrate how the group situation is brought about by the action of genetical laws. The anthropological data only enable one to observe an end result which might have been reached in a number of different ways. An obvious need exists for additional descriptive records relating to hybrid populations which would permit the linking up of anthropological and genetical conclusions and also form a research field of great theoretical and practical interest.

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